FIRE MANAGEMENT

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FIRE MANAGEMENT

An international quarterly periodical devoted to forest fire management

TABLE OF CONTENTS

Order and delivery of supplies and equipment to a large fire requires expert logistical coordination.

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Large fires often require large quantities of supplies and equipment.

Fire Suppression Equipment From GSA

Jerry Daffern

Each year, General Services Administration's Federal Supply Service (FSS) furnishes about $15 million worth of fire suppression equipment and supplies to the Forest Service, Bureau of Land Management, Bureau of Indian Affairs, and cooperating agencies through formal agreements with the Departments of Agriculture and Interior.

Jerry Daffern, National Fire Suppression Coordinator, General Services Administration, Denver Federal Center, Denver, Colo.

The objectives of the FSS are to:

- Facilitate advance procurement planning
- Provide specification development information to USDA Forest Service, Missoula and San Dimas Equipment Development Centers for standardizing fire control equipment and supplies
- Effect savings through consolidated purchasing
- Stock high-demand items in strategically located distribution facilities for quick shipment to users
- Provide centralized supply management for all critical and semicritical fire suppression items.

Pulaski — A High-Demand Item

Let's take the Pulaski as an example of what FSS does to provide supply support to users. The Inventory Management staff and GSA's Fire Program Manager in Denver determine the expected maximum annual usage of Pulaskis by considering demand history and trends and request the procurement of the right number of tools for storage in GSA's Supply Distribution Facilities. These depots are located in Denver, Colo.; Stockton, Calif.; Auburn, Wash.; and Clearfield, Utah. The Clearfield depot stores backup stocks of the 39 "critical items," which include Pulaskis. Clearfield carries 50 percent of the seasonal maximum as a cushion against unusually high demand.

History indicates we must stock the following quantities of Pulaskis: Denver, 7,000; Stockton, 7,800; Auburn, 9,500; and Clearfield, 50 percent of that total or 12,150. Prior to the start of the fire season, FSS should have 36,450 Pulaskis available for issue to users.

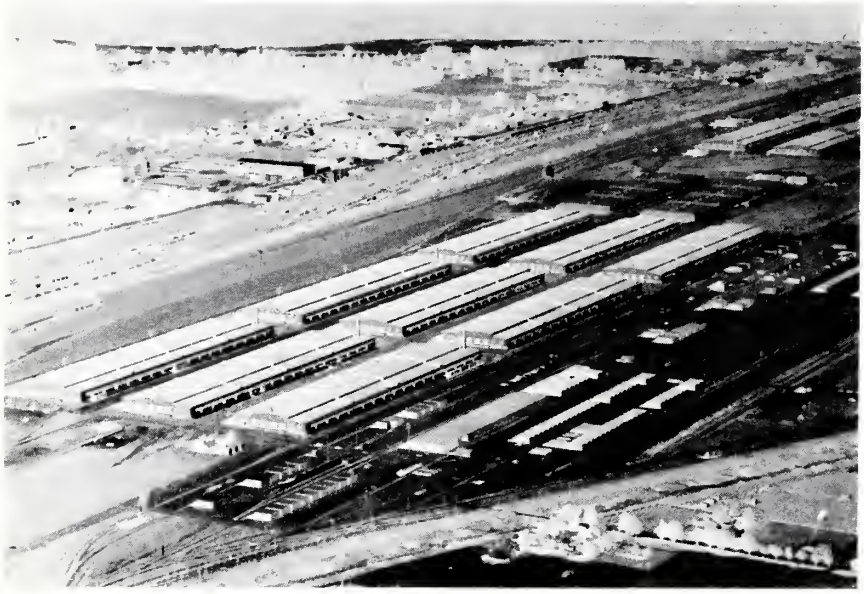
Invitation to Bid

How does GSA go about getting 36,450 Pulaskis by May 1 to be ready for the fire season? In September the Inventory Managers in Denver, San Francisco, and Auburn request pro-

Please turn to page 4

Fire Suppression Equipment From GSA

from page 3



GSA Depot, Denver, Colo. Approximately 750,000 square feet of storage.

curement of the Pulaskis by May 1 of the next year. Procurement begins with an "invitation to bid" for a definite quantity contract for Pulaskis. This invitation tells prospective suppliers of our need for this specific quantity of Pulaskis, the specification under which they will be manufactured, how they are to be packed, and when they are to be shipped to the GSA Supply Distribution Facilities. By the time we mail out the invitations to bid, receive replies, and select the successful bidder, it is October. Most of the tools should be on hand seven months later so FSS can provide immediate support when a requisition is received.

The specification used in the invitation has been carefully prepared by the USFS Missoula Equipment Development Center and concurred in by competent fire management quality control and hand tool experts.

Consolidated Order

If a user bought just one dozen Pulaskis, he would pay about $20 each for them. But the firefighting activity pays only $9 each for purchases from GSA. On this item alone, thousands of dollars are saved each year through consolidation of procurement and distribution.

Many fire suppression items are not readily available from commercial sources which highlights the need for special stock to insure availability.

There are several other services GSA provides to assist fire suppression activities. GSA's fire coordinator and State transportation departments established the use of "exelusive run" commercial carriers who can drive nonstop (except for fueling) from GSA facilities to the fire or fire cache. This means common carriers can deliver as much as 44,000 pounds of fire equipment within 12 hours after GSA receives the fire order with no time-consuming stops at ports of entry. In addition, this procedure saves approximately $7,000 per shipment versus air shipment; in many cases it is faster and more flexible than aircraft usage, because delivery can be made to destination without additional handling.

Communication Important

Another joint effort among GSA, BLM, BIA, and USFS is a national hookup of facsimile machines. This enables the requisitioner to telecopy a fire order direct to Boise Interageney Fire Control Center or to one of the GSA offices in Denver, San Francisco, or Auburn, speeding order processing and shipment.

The FSS regional office in Denver has the primary responsibility of coordinating procurement, inventory management, order processing, and other fire management activities for all of FSS. The National Fire Coordinator works directly for the Regional Commissioner of Federal Supply in Denver. His responsibilities cover complaint investigation of fire items, addition and deletion of items in coordination with using agencies, coordination between FSS and all firefighting agencies, publication of the fire equipment and supplies catalog, and contract administration assistance on many contracts.

Thoroughly trained GSA personnel are on standby duty during the fire season and ready to assist firefighting activities.

During the fire season weekly meetings are held in Denver covering all topics associated with GSA firefighting support responsibilities. With regard to existing shortages of raw materials, many items were being purchased in July and August for delivery in June of next year. An annual interagency meeting is held each November to discuss the coming year's requirements, to work out various problems, and to plan joint actions.

GSA's Federal Supply Service is working diligently to make certain fire suppression equipment and supplies are available for firefighters.

Cover on GSA fire equipment catalog.

Freeze-Dried Food
Another Option for Feeding Firefighters

Wayne Dawson

There are several methods used to feed firefighters — professional catering, frozen meals, and emergency rations. Freeze-dried foods now provide another option.

Catering Takes Time

The professional caterer can provide the most palatable meal with the least effort by camp personnel. However, the caterer must have time to organize and set up his service. Using the professional caterer on fires of less than 3 days duration usually is not practical.

Frozen Meals Bulky

Frozen meals are a good compromise for fires of shorter duration. A major limitation is the length of time between freezer and serving. Unfortunately, few remote fire camps have access to large freezers capable of maintaining the 0° environment required for safe storage of the meals.

Another negative factor is the weight and size of the meals for shipping. Since a box of 10 meals weighs about 33 pounds and fills 4.4 cubic feet, a relatively few meals fill the cargo compartment of an aircraft or a truck. Frozen meals also require heating units. Each unit can heat 30 meals at a time, weighs 103 pounds, and takes up 9.8 cubic feet of space. So, three frozen meals each day for 90 men total 1,200 pounds and fill 148.2 cubic feet of cargo space. The relatively high cost per meal coupled with transportation costs and storage problems have prompted fire agencies to seek other alternatives.

Wayne Dawson is a Fire Specialist, Boise Interagency Fire Center, Bureau of Land Management, USDI, Boise, Idaho.

Emergency Rations

The emergency ration, although convenient, lacks palatability after several meals. The shipping weight per meal is approximately 3 pounds.

Add Hot Water

A freeze-dried meal comes in its own mixing and serving container. The firefighter needs only to add hot water for a hot, nutritious, freshly prepared meal. No special storage is needed in the field, and the weight of less than 1 pound per meal makes them easier to ship or to be carried by the individual firefighter.

The meals come in a choice of two breakfasts and four dinners. Breakfast entrees are eggs and beef hash or eggs and diced ham, plus side dishes such as oatmeal, beverage, and coffee. The dinners consist of spaghetti with meat sauce, veal and barbecue sauce, chicken and rice, or pork and scalloped potatoes. Each dinner is complete with vegetable, soup or side dish, bread, dessert, beverage powder, and coffee.

The meal is packed with its own mixing and serving tray. Included is a collapsible cup for drinking and measuring water for reconstituting the meals. Reconstitution varies between immediate and 5 minutes, depending upon the food. Meat, potatoes, and so forth take more time than the more granulated powders. The entire unit is disposable after the meal.

Warehousing is simplified since the freeze-dried meal does not require the specialized storage of frozen food. The weight per meal makes loading and shipping easier than either frozen meals or emergency rations. The freeze-dried meals are comparable in price to the frozen: Each meal costs $4.25.

Please turn to page 16

New System for Transporting, Storing, and Mixing Fire Retardants

Ted L. Pickett

The Forest Service and cooperating agencies maintain a number of permanent and temporary fire retardant bases. These bases have facilities for storing, mixing, and loading fire retardant chemicals onto fixed-wing aircraft, helicopters, and ground tankers. The San Dimas Equipment Development Center recently evaluated several available systems aimed at reducing manpower requirements at these bases. In 1973, 16 million gallons of these chemicals were applied to wildfires. Reducing the cost of any part of the retardant process — storage, mixing, or delivery — can result in major dollar savings.

Ted L. Pickett is a Mechanical Engineer with the USDA Forest Service San Dimas Equipment Development Center, San Dimas, Calif.

Phos-Bin

A significant development in this area is Monsanto Company's Phos-Bin for transporting, storing, and mixing 1 ton of the company's Phos-Chek dry powder — enough to make up 1,870 gallons of fire retardant. This system requires much less manpower than previous retardant delivery/mixing systems involving bagged formulations, resulting in an appreciable cost saving. The Phos-Bin also makes possible the setting up of a truly mobile temporary fire retardant base, since no storage shed is needed. The bin container provides adequate protection for the Phos-Chek under most outdoor storage conditions.

A Phos-Bin loaded with dry retardant stands 4 feet high and comes mounted on a special 42-inch diameter, disc-shaped, molded plastic pallet. This pallet has two openings per quadrant for forklift use and serves as an "airside" during mixing operations. For airslide-ejection mixing the pallet is fitted with quick-connect hose fittings, one for blower-supplied air and one for an ejector mixer.

Phos-Bin bag on its pallet is easily moved about by forklift truck.

The fire retardant system: left to right, Phos-Bin bag, blower, and ejector mixer.

Early Developments

The most popular method of mixing dry Phos-Chek chemicals with water has been the continous flow system incorporating an ejector mixer. The ejector mixer will not function unless the dry retardant powder is "fluidized" or highly aerated. In the past, one of two other airslide devices has been employed to aerate the dry retardant. The first is an airslide hopper, into which personnel emptied the dry chemicals from paper bags that they had to break open. The other is an airslide trailer, similar to those used for bulk transporting and handling of cement and other dry powders. Both these early systems are still in use to an extent.

Both the trailer and hopper airslides have bottoms of multilayered canvas or other easily damaged porous material. With the Phos-Bin, the air passes through the sturdy molded plastic pallet.

Phos-Bins are now coming into use at permanent retardant bases because they are effective and simple, and make supply, transportation, and handling much easier than past systems — especially those requiring manual breaking of small bags.

The San Dimas Equipment Development Center has participated in the development of the Phos-Bin since 1972. During this time, the bag, pallet, and procedures have evolved into a reliable, economical, and effective method of providing mixed fire retardant chemicals for air and ground attack on wildfires. The Phos-Bin system can be considered a fully operational system.

Molded plastic pallet used with Phos-Bin bags.

Forest Fire and Atmospheric Sciences Research Publications

A list of available forest fire and atmospheric sciences research publications published during the period January 1973–December 1973 may be obtained by writing:

Craig C. Chandler, Director
Forest Fire and Atmospheric
Sciences Research
Forest Service, USDA
South Building
12th & Independence Ave., SW
Washington, D.C. 20250

Equip Tips

PARTMENT OF AGRICULTURE – FOREST SERVICE EQUIPMENT DEVELOPMENT CENTER – MISSOULA, MONTA

GSA Hardhats

Donald L. Sirois

The following *Equip Tips* publications are available free on request from the Chief, Forest Service, U. S. Department of Agriculture, Washington, D.C. 20250.

Aids for Battery Selection presents basic essentials for selecting battery replacements or substitutions where physical size and voltage are fixed but cost or performance alternatives may exist. No. 7100. Sept. 1974.

Safer Detonator Available provides information about a new explosives detonator. Principal advantage of the Exploding Bridgewire (EBW) is increased safety for blasting operations. Extraneous electricity cannot detonate it. No. 6170. Oct. 1974.

GSA Hardhats points out how GSA hats comply with the Occupational Safety and Health Act (OSHA) of 1970. No. 6170, 5100. Sept. 1974.

Donald L. Sirois is a Mechanical Engineer on the Washington Office Forest Service–USDA Engineering Staff.

Treating and Utilizing Slash

Mike Lambert

Engineers at the San Dimas Equipment Development Center (SDEDC), USDA Forest Service, are testing equipment and methods for the treatment and utilization of slash. Slash is the residue left in the forest after timber has been cut, trees have been thinned out, or roads constructed. Slash consists of tops and limbs, cull logs, root wads, and stumps.

Left lying on the forest floor, this material can cause all sorts of problems — one of the more serious being creation of a fire hazard. Further, in this age of raw materials shortages, it is important to use as much of this "waste" wood fiber as possible.

Thus, SDEDC has been investigating ways to handle, transport, and convert slash material into usable forms such as chips, flakes, and particles for fiberboard or paper. Studies have included debarking and the removal of dirt, char, and rot so that more "clean" wood will be available for the Nation's mills.

Mike Lambert is a Mechanical Engineer located at the USDA Forest Service, Equipment Development Center, San Dimas, Calif.

Lowering Fire Hazard

SDEDC is investigating in depth about 50 different pieces of equipment (including crushers, choppers, cutters, flails, and hammer mills) that have potential to mechanically reduce slash material. The purpose is to find devices that will break up and compact the small, flashy aerial material (foliage, bark, small limbs, and twigs) to reduce fire hazard and provide a maximum of natural nutrients for decomposition to aid forest regeneration.

The equipment studied has proven less than ideal for the job since most pieces were not originally designed to work in the forest and treat slash. As this became apparent, Forest Service engineers and technicians at a slash-cutting test facility began generating the basic data needed to design an efficient treatment tool. The effort to determine the best mechanical cutting device and its energy requirement is aimed at forming a specification for a machine that can simultaneously thin young timber stands and treat the resulting slash.

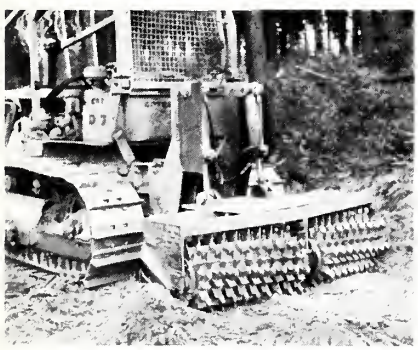
Possible Approaches

Such a combination machine should be suitable also for treating much of the 6-inch and smaller slash left by logging operations — once large logging and road construction residues have been removed and used. For the latter, a number of stump splitting and removing devices have been studied.

Another approach to disposing of unusable portion of heavy slash from logging or road construction activities appears to be air curtain burning. This is an efficient, nonpolluting method of controlled incineration for unusable slash material. Specialized burning equipment is used to produce relatively smokeless burning at temperatures above 1600°F. Forced air, moving at 100 mph, supplies oxygen for intense combustion and drives volative gases into an air curtain where secondary combustion takes plaee — resulting in a complete, no-smoke burn.

Benefits

San Dimas tests should provide insights into the magnitude of the slash problems and the effort already under way to solve the problem. Evaluations of machines available for purchase or rent to treat or utilize slash will be available, as will suggestions for other approaches to slash and criteria for slash treatment/utilization decision-making. This information should expand our knowledge of what to do about forest residues.



A special forestry model cutter/crusher/compactor — one of many pieces of mechanical equipment investigated as a possible slash treatment device.

Machine for simultaneous tree thinning and slash treatment that has been investigated by Equipment Development Center engineers.

Air curtain burner consuming cull logs without producing any significant air pollution. Fire is confined to pit dug into ground.

What CAN San Dimas Do for You?

Maybe a better question than "what CAN we do?" is "what SHOULD we be doing for you?" The San Dimas Center has a proven reputation over many years of developing good equipment. This reputation includes development of equipment for range, recreation, wildlife, timber, and other functional activities in addition to firefighting equipment. We have helped develop specifications for such items as spark arresters, pumps, hose, and other hardware. We estimate that millions of dollars are saved by using our purchase specifications.

What We Are Doing

Our highest priority program is to find ways to utilize or reduce volumes of slash or wood residues. Our objectives encompass needs of both Timber and Fire Management. We have successfully tested a prototype machine to clean odd-sized and odd-shaped wood for utilization of residues.

Bark, decayed wood, and char are removed and further testing is under way to define production rates and costs before a production model is fabricated and tested.

By the Spring of 1975, we expect to field test a TSI machine to thin and treat the slash in one pass. This machine will also be able to treat downed slash, such as limbs and tops, following a logging operation.

Some of the pumps and generators used in firefighting exceed OSHA noise limits. We are working to quiet these machines and to protect our firefighters from hearing loss.

You may have read of our night helicopter test program and know that using night vision equipment, helicopters can have a 24-hour round-the-clock flying capability.

Field Support

We respond to your letters, phone calls, and requests for our Staff to study a problem or to attend one of your committee meetings. We provide support consisting of specifications, pump tests, retardant tests, spark ignition studies, and other activities that produce sizeable monetary benefits.

These activities are continuing and unending. Many of you think of SAN DIMAS only as a Development Center, but these continuing activities ensure that available equipment measures up to our firefighting needs.

So how about it: "what should San Dimas be doing for you?" Give us some feedback.

Boone Y. Richardson is Director of the San Dimas Equipment Development Center, Forest Service, USDA, San Dimas, California.

Equipment Development and Test Program Report Available

The information in this report has been developed for the guidance of employees of the USDA Forest Service, its contractors, and its cooperating Federal and State agencies. To obtain a copy of the report and further information, please contact:

Missoula Equipment Development Center

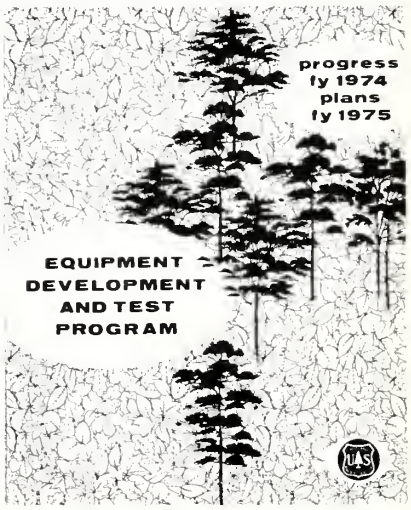
Director
USDA — Forest Service
Equipment Development Center
Fort Missoula
Missoula, Mont. 59801

San Dimas Equipment Development Center

Director
USDA — Forest Service
Equipment Development Center
444 East Bonita Avenue
San Dimas, Calif. 91773

Southern Region Equipment Development Engineer

Regional Engineer
USDA — Forest Service
Southern Region
1720 Peachtree Road, N.W.
Atlanta, Ga. 30309.

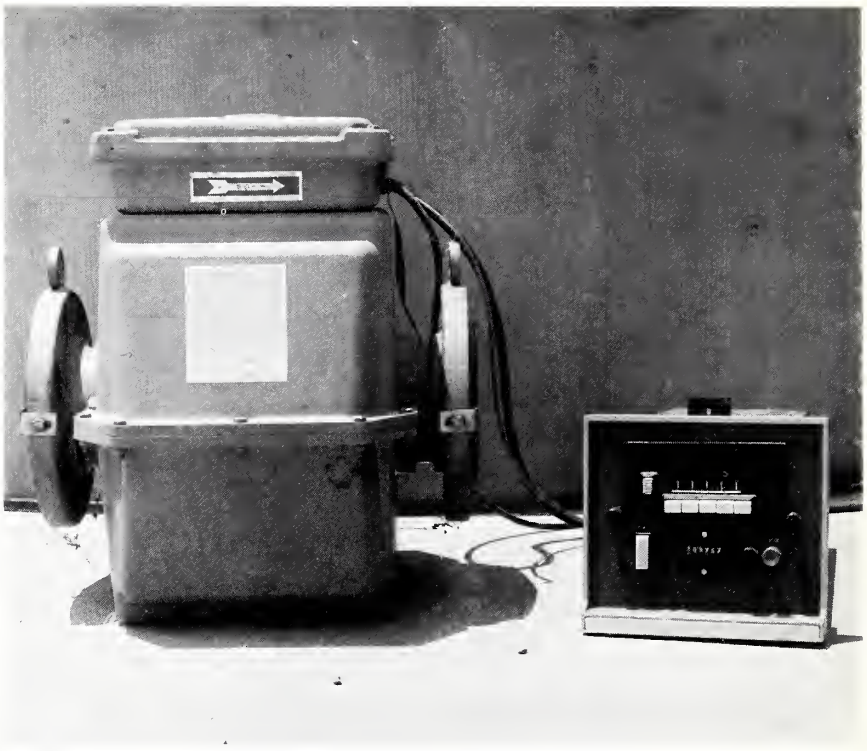


Magnetic Flowmeter Accurately Measures Retardant Loaded Onto Air Tankers

Anthony D. Spitek

Magnetic flowmeters have no moving parts "in line" and are not as subject to clogging and excessive wear as mechancial meters. They have proven accurate for measuring the quantity of retardant loaded onto air tankers, for determination of payment to contractors and to determine a safe maximum allowable takeoff load.

An all-time yearly high of fire retardant was dropped on going forest fires in calendar year 1973. Almost 16 million gallons of retardant were released by aircraft upon 3,288 fires. The aircraft are supported by about 40 air tanker bases using various systems for storing, mixing, and pumping fire retardant chemicals. An improved device has been needed to accurately measure the quantity of retardant as it is loaded into the air tanker.



Magnetic flowmeter and totalizer counter.

How Heavy the Load?

This question is serious because the weight of a retardant load onboard an aircraft is a prime safety concern during takeoff. A pilot must calculate the maximum allowable takeoff load based on the air base's elevation and temperature.

Market Search for Flowmeters

The Forest Service Equipment Development Center at San Dimas, California, was given the task of finding a device to accurately measure the amount of retardant being loaded into air tankers. A market search was conducted that located 44 firms that supply flowmeters. Thirty of these firms submitted proposals on their meters in response to Forest Service criteria. Five different types of flowmeters were proposed, and the most promising of each was selected for testing.

Flowmeter Comparison Tests

To conduct the tests, a fire retardant mixing and pumping station was set up at San Dimas and the flowmeters submitted for tests were placed in line with a pump and a weigh tank to determine each meter's aceuracy. The four mechanical flowmeters (vortex, positive displaeement, turbine, and propeller) soon dropped out of the running.

Magnetic flowmeters were the fifth type tested and were supplied by Brooks Instrument Division and Fischer & Porter Co. The magnetic flowmeter does not have moving parts "in line" and is not subject to clogging or excessive wear as the mechanical meter. This meter provided accurate measures of retardant volumes.

Flowmeter Field Tests

Magnetic flowmeters were installed at two California air bases, where further tests were conducted. At Ramona, Fire-Trol 100 was the retardant used; at Hemet Phos-Chek 202X-A. Flow rates, line pressure, viscosity, etc., were varied to give the meters a real workout. The value of accurate metering showed up during these tests. When measuring the quantity of retardant it is important to allow for air bubbles entrapped in the viscous chemicals. By calibrating the magnetic meters to account for the air entrapped within the retardant mix, a true reading of the actual retardant loaded on air tankers can be measured. Air entrapment in retardant mixes varies from 2 to 10 percent, and 5 percent is typical at most air tanker bases.

Anthony D. Spitek is an Engineering Technician, USDA, Forest Service, located at San Dimas Equipment Development Center, San Dimas, California.

Operational Trial Results

The Southwestern Region requested contractors to install magnetic meters at five air bases. San Dimas Equipment Development Center and Brooks Instrument people helped set up and calibrate the meters. One major problem was caused by the high temperatures at bases in Arizona and New Mexico (thermometers were registering as high as 115°F). Internal temperatures of the meters ran a high of 200°F, causing calibration drift. The solution was to protect the meters from the sun with louvered aluminum reflective shelters. Trial use showed these meters worked satisfactorily when protected from the hot sun. Also it helped to install the flowmeter in a low spot in the line and schedule seasonal calibration checks.

Anyone planning to upgrade a retardant mixing/pumping/loading system at an air tanker base by installing a magnetic flowmeter may contact the experienced personnel at San Dimas for advice and assistance.

Magnetic Meters the Answer

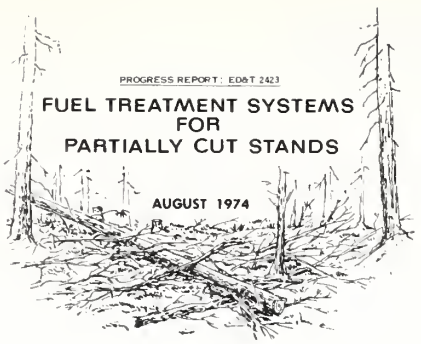
In January, the San Dimas Equipment Development Center wrote the project record on all the flowmeter tests.[1]

The Forest Service, USDA, Washington Office, Fire and Aviation Management, has directed all Regions to use tested retardant flowmeters. Since that time the California Region has installed the Brooks Mag-meters at three major air hases, Goleta, Ontario, and Redding (under the auspices of the California Division of Forestry).

When proper procedures for installation and calibration are used, tested magnetic flowmeters accurately measure quantity of retardant loaded onto air tankers.

[1]Kurtz Robert and James Tour. Retardant flowmeter for air tanker bases. USDA Forest Serv., ED&T 2128, 1974.

FIRE MANAGEMENT



Donald J. Weatherhead

The Missoula Equipment Development Center began a project in fiscal 1974 to investigate fuel treatment systems for partially cut stands. Some of the conclusions of the first year's work are:

1. A problem analysis indicated that most land managers have no reliable or accurate method of predicting fuel residues resulting from a particular partial cut sale prior to harvesting. No method exists for quantitatively specifying fuel treatment objectives to determine feasible fuel treatment methods. Techniques are not available to estimate the associated costs of a particular fuel treatment for a particular set of sale conditions. Therefore, the goal of the project is to develop a decisionmaking model to predict fuel loadings, fuel treatment needs, treatment alternatives, and associated costs prior to harvesting for a specific set of sale conditions. The exact format of the model has not been determined but may consist of a computer program or an algorithm using charts and a calculator.

2. A fuel prediction model which has been completed appears to provide a reasonable method to visualize resulting fuels prior to harvesting. Accuracy of the model will depend on the experience of field personnel using the tool.

3. Accurate data for developing fuel treatment production rate schedules which consider significant variables are not available.

4. A test indicated that the use of expert opinion to generate production rate data is feasible.

For further details of the project contact MEDC, USDA Forest Service, Missoula, Mont. 59801.

Donald J. Weatherhead is a Forester located at the USDA Forest Service Equipment Development Center, Missoula, Mont.

Wildfires is a new reference manual for any firefighting unit which must contend with fires in natural cover. Written for fire crews and their immediate supervisors. Wildfires combines pictures and text of tactics and fireground safety with a complete rundown of tools and equipment. Procedural descriptions of fire combat methods show how tools are used to suppress wildfires.

Published in November 1974, the manual is 8½" x 11" paperhound with over 400 pages and 230 illustrations. Cost is $14.95 and is available from:

The Robert J. Brady Co.
A Prentice-Hall Company
Bowie, Md. 20715

Airborne Igniters for Prescribed Burning

Stephen S. Sackett

Figure 1. — Spot fires ignited by airborne lucifers starting in decadent sawgrass strands. (Photography by Everglades National Park.)

A delayed action ignition device (DAID) has been developed at the Southern Forest Fire Laboratory for ejecting from helicopters. These airborne "lucifers" are easy and inexpensive to make and use and have proven effective in tests in the Everglades National Park under a variety of fuel conditions.

Prescribed burning is a common silvicultural tool in the South and is becoming more popular for fuels management in other parts of the country. In the South nearly 2.5 million acres of wild land a year receive some type of fire treatment. Nevertheless, many land managers find it impossible to take full advantage of ideal prescribed burning conditions because they cannot rapidly ignite large acreages that are scheduled for burning.

Faced with similar problems in their burning programs the Australians developed a system for dropping igniters from fixed-wing aircraft. [1] [2] The system incorporates a dispensing machine that injects ethylene-glycol into a plastic capsule previously filled with potassium permanganate and automatically ejects the ignition device from a chute in the aircraft. In about 30 seconds the chemicals react to produce an ignition source for ground fuels.

Australian Match

Another device, the "Australian Match," has been used extensively by the Victoria Forests Commission[3] and has gained wide acceptance in Australia, mostly because of its simplicity. This unit is a 7-inch length of fuse half of which is coated with a modified matchhead compound covered with wax to prevent accidental striking. The other end of the DAID is coated with a small amount of matchhead compound for striking and igniting the fuse. The modified compound ignites 17 seconds after striking (as the fuse burns down to it) and burns for 40 seconds with a small flame.

The Australian match has been used successfully in prescribed burning for improvement of elk ranges in Idaho[4] where ground access is difficult and dangerous.

Backfire Starter Cartridge

The Olin Corporation has produced, in limited numbers, a backfire starter cartridge that can be fired from a 12-gauge shotgun. This device produces an extremely hot flame that is adequate for igniting most light surface fuels. The cartridge is considerably more expensive than the "match," but is better adapted for launching from the ground.

New DAID

The airborne ignition device described here, was developed in response to a problem encountered by the Everglades National Park in Florida. The park needed an airborne device to ignite and revitalize extensive

Figure 2. — Delayed action ignition device (DAID) waxed and ready for use.

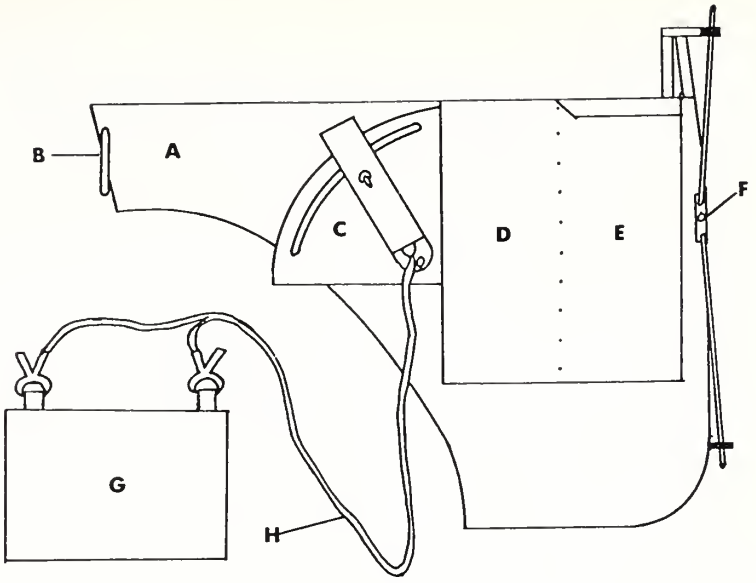
Stephen S. Sackett is Research Forester, Rocky Mountain Forest Range Experiment Station, Forest Hydrology Laboratory, Tempe, Arizona.

bands of decadent sawgrass. These sawgrass strands are composed of dead, matted, reed material standing in 6 to 12 inches of water. To be effective, the igniter must land on the grass surface without penetrating into the water below. The igniters could also be used in pine stands where ground access is hazardous.

Using the igniters from a helicopter is easy and convenient. The airborne "lucifers" can be dropped rapidly and accurately for adequate spacing of spot fires (fig. 1). Although spot fires are not a common means of ignition, they can be useful in regulating intensities[5] and for rapidfiring of large areas. Adequate air speed (50 knots) and elevation (100–200 feet) should be maintained for safe operation, and igniters should be dropped on the lee side of the helicopter to avoid the chance of the igniter going under the aircraft. On the return pass (when the bombardier is on the windward side of the craft) ignition spacing can be checked.

The DAID system developed for the Everglades offers some advantages over each of the other systems. The individual units cost about 15¢ each and can be quickly assembled by hand from readily obtainable materials. A battery-powered cigarette lighter element can be used to ignite the units. The entire system should be positioned on the exterior of the helicopter. The DAID unit is composed of a 6-inch stem of orange wax safety fuse with a burning rate of 3.3 seconds per inch (total of 20 seconds delay) and an 8-inch length of Thermalite Igniter Cord, Type B. One end of the igniter cord is inserted in a slit in the end of the safety fuse and the remainder of the igniter cord is wrapped tightly around the orange safety fuse (fig. 2). The end where the two are joined is dipped in household paraffin to protect the fuse from moisture and make the union more secure.

Figure 3 shows the entire system mounted on the exterior of a modified helicopter door. The 12-volt battery is in a plastic container and is secured to a plate on the outside of the helicopter. The igniter unit has a female connector wired on the hot side of the power wire to avoid shorting should the line be disconnected. Also, the switch on the igniter unit should be wired into the positive line. (Wiring diagram available upon request.) The electrical igniter, DAID storage box, and helicopter door can be jettisoned by pulling a quick release handle. Anyone using the modified half door must obtain a waiver of Part 103 of the FAA Regulations from the FAA Flight Standards District Office in his area.



A. Helicopter half-door
B. Door latch (normal operation)
C. Electrical DAID igniter, adjustable
D. Standby section, DAID storage box, no top
E. Large volume storage, DAID storage box, hinged top
F. Quick release door latch (to jettison door in case of emergency)
G. 12-volt auto battery
H. Power cord for igniter w/breakaway connectors

Figure 3.—Helicopter half door with DAID storage box and electrical igniter attached.

Where large-scale prescribed burning is planned in uninhabited areas, the airborne ignition system described here can be highly efficient. The system could also be used in areas where there are improvements that require protection, but adequate pre-planning and good coordination with ground teams would be needed. In addition, the system could be used effectively for burning out a wildfire where there are adequate ground fuels.

[1]J. R. Baxter, D. R. Packham, and G. B. Peet. Control burning from aircraft. CSIRO, July 1966.

[2]D. R. Packham and G. B. Peet. Developments in controlled burning from aircraft. CSIRO, Oct. 1967.

[3]A. Hodgson. Aerial ignition of forest fuels from helicopters. Aircraft, p. 30–31, Sept. 1969.

[4]T. A. Leege and C. M. Fultz. Aerial ignition of Idaho elk ranges. J. Wildl. Manage. 36 (4):1332–1336. Oct. 1972.

[5]S. S. Sackett. A field trial for regulating fire intensities. Fire Control Notes 29 (3): 5–6, July 1968.

"Roll Bar" Crawler Tractor Brush Guards Have Dual Function

Myron Tupper

North Carolina Division of Forest Resource's new "roll bar" type crawler tractor brush guard doubles as a water tank and offers greater driver protection. Fire control crawler tractors are often used in steep, hazardous terrain and can tip or roll over, so they must be equipped with a brush guard. The "roller bar" style has proven most satisfactory.

Brush guards are usually flat and lack the strength to withstand a severe blow from a heavy object such as a falling snag, or the weight of the tractor, if it should roll over. Also, if a backpack pump is carried on the tractor they often rupture and the water is lost, along with the chance to save the tractor (and possibly the driver himself) if the fire suddenly shifted toward him.

Rangers in the North Carolina Division of Forest Resources recognized these problems, and one of them, Gene Lanier of the Division's Fayetteville District Office, came up with a solution: A brush guard, heavy enough to support the tractor, that doubles as a water tank. Lanier constructed the main portion of the brush guard using 4-inch square steel tubing for the base and three arches of 4-inch round steel tubing — like the roll bars in racing cars.

Myron Tupper is with the North Carolina Division of Forest Resources, Fayetteville, N.C.

Designer Gene Lanier is shown with one of the completed brush guards mounted on a tractor. Notice escape holes on rear of brush guard.

Arches Filled with Water

Both the base and the arches were made watertight and filled with water under air pressure up to 150 pounds. A series of gauges and valves allows the operator to determine the right amount of water and air which should be used. The new water carrying brush guard hold 8½ to 10 gallons of water. This is double the amount carried in the backpack pumps previously used and the chances of having the water available, when needed, are greatly increased. A regular garden hose, long enough to reach around the tractor, can be used to wet down the tractor and adjacent area. The frame of the brush guard is covered with steel mesh and a steel top. The back of the guard is equipped with two escape holes on both sides. The entire cage is then bolted to the tractor frame.

"Roll Bar" Saves Driver

While fighting a night fire, three weeks after one of the District's tractor-plows were equipped with the new brush guard, the unit rolled over into a river gorge and into deep water. The tractor driver crawled out and made it to safety. Even though the tractor was lying on its top, the arches held and were not bent. The only damage to the brush guard were a few small dents on the steel top. Local veteran firefighters believe that if the tractor had been equipped with the old-type brush guard, it would have collapsed and trapped the operator.

Drawings of brush guard/water tank are available from the Field Facilities Section, N.C. Division of Forest Resources, Post Office Box 27687, Raleigh, N.C. 27611.

A Versatile Tanker

W. J. Vogel

Yakima Indian Reservation fire control personnel had long realized their need of a large tanker which could serve as a source of water for smaller units during firefighting operations. But, long-range planning dictated the necessity to first improve and expand the smaller-sized initial-attack pumper and tanker fleet and bulldozer units. By the winter of 1973–74, these first priority requirements had been achieved and efforts could be devoted to developing and procuring a larger tanker unit.

Tanker Must Be Versatile

In order to justify the expenditure, the unit would have to be versatile and not limited to a role of "mother" tanker. Along with this requirement, it would have to be capable of serving equally well in both the forested and range areas. The 1.4 million-acre Yakima Indian Reservation in the south-central part of Washington State is timbered and contains more timber than any other reservation in the United States. The eastern half is grass and brushlands, and these two distinctly different areas present divergent fire control problems. In addition, the entire area is arid during the summer with a yearly average precipitation of 10″ in the grass-brush areas and up to approximately 40″ in the western timbered portion. Most of the precipitation occurs during the winter months. Water sources for firefighting during the summer fire season are few and far between. Also, access is limited into many areas which restricts the size and type of tanker.

W. J. Vogel is Fire Control Officer of Yakima Indian Reservation, Bureau of Indian Affairs, USDI, Toppenish, Wash.

The truck is a 35,000 GVW Diamond-Reo 4 x 4 with 468 CID V–8 gasoline engine.

GSA Supplies Vehicle

Our chassis-engine needs were made known to the General Services Administration who supply the Branch of Forestry's vehicles. The truck they provided was a 35,000 GVW Diamond-Reo 4 x 4 with a 468 CID V–8 gasoline engine and equipped with airbrakes and power steering.

Upon receiving the truck, fire control personnel developed specifications for the remainder of the unit and a construction contract was awarded to P. E. Van Pelt Inc., Oakdale, Calif. The truck was taken to their shop for fabrication. The tank installed has a 1500-gallon capacity, and may be filled either by drafting with a 3″ suction inlet or from a hydrant or other water sources. The pump is a single stage centrifugal, capable of delivering a maximum of 250–300 gpm.

The tanker serves as a "mother" tanker, as well as a water source for mop-up operations. To serve these two needs, a 2½″ outlet was placed on each side of the truck, a 1½″ liveline at the rear. Thus, any one of these outlets can be used for filling pumpers, or "Y"d to provide a number of smaller-sized lines for mop-up purposes. This same system of "Y"s can be used for holding a portion of line during backfiring operations or initial attack. A live-reel at the rear with ¾″ hose is used for initial attack or mop-up purposes. In addition, the high volume output of the unit enables it to control fires caused by vehicles that occasionally occur on a major cross-state highway crossing through the highly flammable grass-brush area. The unit also serves as protection for structures threatened by or afire from grass/brush fires in the protection area.

There are a number of compartments along each side and the rear for storage of extra hose, rations and fittings. The unit is equipped with two-way FM radio.

Please see picture page 16

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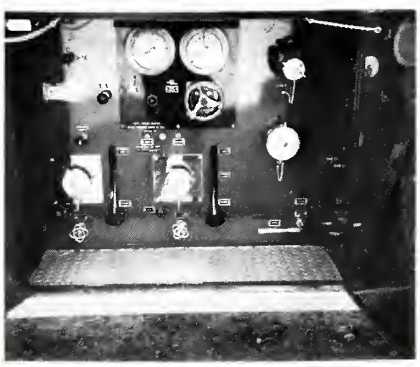
A Versatile Tanker—*from page 15*

Tank has 1500-gallon capacity, filled by 3" suction inlet or from hydrant.



Control panel for single stage centrifugal pumps capable of delivering a maximum 250–300 gpm.

Freeze-Dried Food
from page 5

Several companies are producing freeze-dried foods for the backpacker and outdoorsman. One company is experimenting with bulk packaging in 25-man units to be compatible with a 25-man single meal mess unit.

On Trial

Final adoption of any freeze-dried ration will, of course, depend on field acceptance and use. These meals are currently available to governmental fire agencies from the Boise Interagency Fire Center fire catalog. This 114-page catalog covers approximately 1,350 individual fire items and kits and is available to authorized agencies from the Director, Boise Interagency Fire Center, 3905 Vista Avenue, Boise, Idaho 83704. The freeze-dried ration is also available from Handi-Food, Missoula, Montana.

FIRE MANAGEMENT

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